Pancreaticoduodenal artery aneurysm: A case report and review of the literature

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A case of true pancreaticoduodenal artery (PDA) aneurysm is reported. A calcified lesion was initially detected by plain x-ray films, and an essential diagnosis was made before operation by intravenous digital subtraction angiography (IVDSA). Surgical resection of the aneurysm was performed successfully. Additionally, we reviewed a total of 82 cases with PDA aneurysm out of the 88 cases that had been reported in the English-language literature up to 1993. Fifty-three cases were accompanied by aneurysmal rupture (rupture group), and 29, including our case, were without rupture (nonrupture group). Because of the high mortality rate (49.1%) in the rupture group, a precise diagnosis and adequate treatment of PDA aneurysm before rupture is important. In the nonrupture group, a calcification on radiography appeared in 61.6% of the cases in which aneurysms were not found incidentally; this seems to be a significant indication for angiography. Moreover, intravenous digital subtraction angiography is quite useful for the screening of PDA aneurysm because it is an easy and noninvasive examination. (J VASC SURG 1995;22:161-6.)

Aneurysms of splanchnic vessels are relatively uncommon. In particular, pancreaticoduodenal artery (PDA) aneurysms are rare, with a reported incidence of 2% among all splanchnic artery aneurysms.[1] Most of these lesions are undetectable until symptoms of rupture occur. After catastrophic bleeding into the gastrointestinal tract or fatal intraperitoneal hemorrhage, the initial diagnosis of PDA aneurysm is often made by urgent angiography or even by intraoperative findings. The case reported here was precisely diagnosed as a PDA aneurysm before its rupture and was successfully treated by resection. This study also reviews previous reports of PDA aneurysm in the literature with special reference to preoperative diagnosis.

CASE REPORT

A 78-year-old man was admitted to our hospital for surgical treatment of incisional hernia after appendectomy. Although he had been treated for hypertension for 10 years, there was no history of systemic vascular disease, abdominal trauma, or pancreatitis. After admission, his blood pressure was well controlled, and surgical repair of the incisional hernia was carried out. In postoperative abdominal x-ray films, a round, calcified lesion was initially noted at the right upper quadrant of the abdomen (Fig. 1). Ultrasonography demonstrated no stones in the gallbladder, and an upper gastrointestinal series showed neither diverticulum nor submucosal tumor of the duodenum. Computed tomography revealed a round calcification beneath the pancreas head and marked calcification of the abdominal aorta and iliac vessels (Fig. 2). Intravenous digital subtraction angiography (IVDSA) demonstrated a saccular aneurysm at the junction between the dilated pancreatic dorsal artery and the posterior inferior PDA. This saccular aneurysm coincided with the calcification (Fig. 3). Stenosis of the celiac axis was also observed, and the main blood flow in the celiac artery seemed to come from the superior mesenteric artery through both the pancreatic arcades and the dilated pancreatic dorsal artery. These findings were confirmed by conventional arteriography with use of Seldinger's method (Fig. 4). Surgical treatment was performed immediately. At laparotomy there was no free peritoneal blood or retroperitoneal hematoma. After the Kocher maneuver was performed on the duodenum, a 3 cm aneurysm embedded within the pancreas was palpable. The aneurysm was carefully isolated from the pancreatic tissue and completely resected (Fig. 5).

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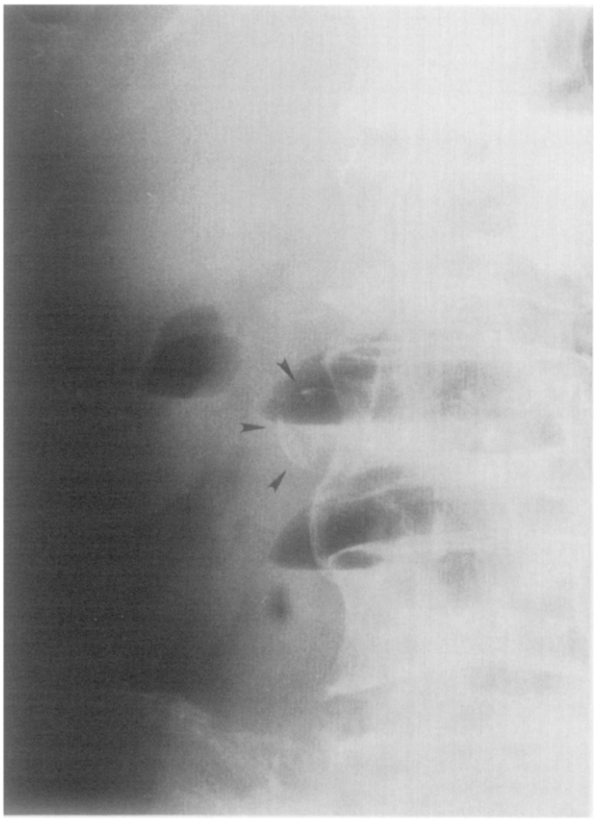

Fig. 1. Plain radiogram shows rim of calcification *(arrow)* at right upper quadrant of abdomen.

Because of preservation of the anterior pancreatic arcade, there was an excellent pulse in the hepatic artery even after resection of the aneurysm. Histologic examination revealed true aneurysm with atherosclerotic change.

The postoperative course was uneventful and the patient was discharged from our hospital on the fourteenth postoperative day.

DISCUSSION

Since the first case of PDA aneurysm was reported by Ferguson[2] in 1895, 88 cases have been reported in the English-language literature up to 1993. However, it is difficult to make an accurate diagnosis of this lesion without symptoms of rupture, and most cases are first diagnosed as PDA aneurysm only by urgent examinations or exploratory laparotomies after catastrophic bleeding into the gastrointestinal tract, retroperitoneal space, or intraperitoneal cavity. Because this bleeding is sometimes fatal, it is important to make an accurate diagnosis of an asymptomatic PDA aneurysm before its rupture. With this in mind, we analyzed 82 well-documented cases.

Of the 82 cases, 53 were accompanied by aneurysmal rupture (rupture group), and 29, including our case, were without rupture (nonrupture group). In the rupture group, gastrointestinal bleeding occurred in 28 cases, massive peritoneal bleeding in 9, and retroperitoneal hematoma in 16. The incidence of rupture of PDA aneurysm is 64.6% (53/82), a value similar to the 60% reported by West[3] in 1968. A summary of the diagnosis and treatment in these 82 cases is presented in Table I. In the rupture group, the correct diagnosis was made by preoperative angiography in 36.0% of the cases (18/50), an exploratory laparotomy provided the diagnosis initially in 46% (23/50), and the lesion was discovered for the first time at autopsy in 18% (9/50). Curative operation was performed in 28 cases (suture ligation in 20 cases, resection in 4, and pancreaticoduodenectomy in 4). Noncurative operation such as simple laparotomy was carried out in 11 cases. The total mortality rate of the rupture group was 49.1%, and the operative mortality rate was 43.6%. In the nonrupture group, the correct diagnosis was made by preoperative angiography in 65.5% of the cases (19/29), including eight cases in which an aneurysm was incidentally discovered during an angiography for an unrelated disease. An intraoperative diagnosis was made in 31.0% of the cases (9/29), including two cases in which an incidental diagnosis was made during an operation for an unrelated disease. In only one case was an aneurysm discovered incidentally at autopsy. The overall rate of incidental diagnosis was 37.9% (11/29). Although curative operation was performed in 17 cases, five cases were followed up without treatment. The operative mortality rate was 0%. Seven cases with small aneurysms (diameters less than 2 cm) experienced aneurysmal rupture. By contrast, five cases with large aneurysms (4 cm or more in diameter) remained without rupture. Moreover, the size of the aneurysm was unknown in two thirds of the cases in the rupture group. Consequently, it is difficult to predict the risk for aneurysmal rupture on the basis of the size of the aneurysm.

A summary of the diagnoses in the nonrupture group is presented in Table II, excluding incidental diagnoses. Eleven cases were correctly diagnosed as PDA aneurysm by preoperative angiography, and seven were diagnosed by exploratory laparotomy. The most common chief complaint was vague abdominal pain. The most frequent indication for further examination such as angiography or exploration was calcification on plain radiography or com-

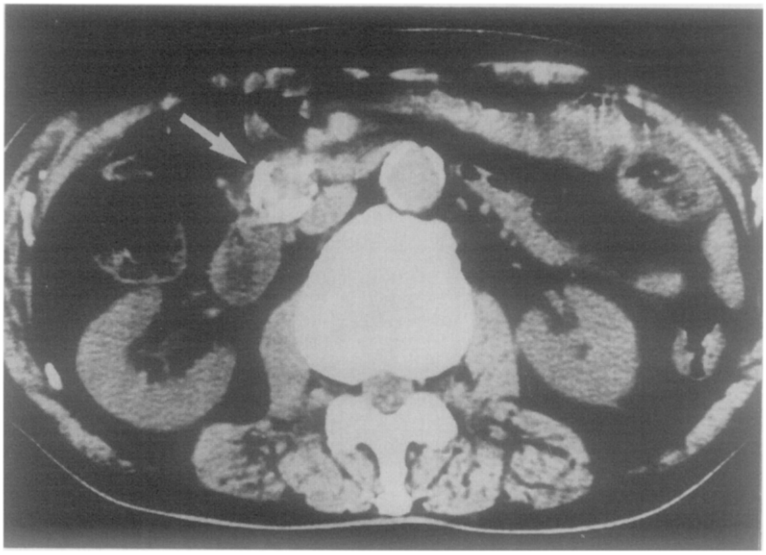

Fig. 2. Computed tomography scan shows calcified lesion beneath pancreas head *(arrow)* and marked calcification of abdominal aorta.

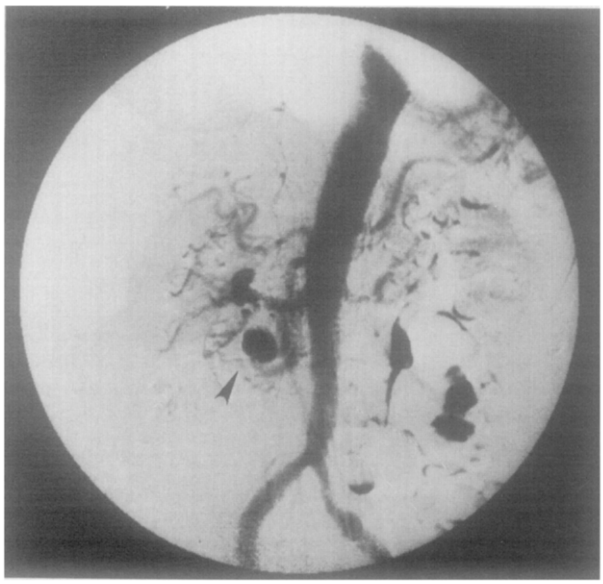

Fig. 3. Intravenous digital subtraction angiogram reveals saccular aneurysm *(arrow)* at pancreatic arcade.

puted tomography, which appeared in 61.6% of the cases (11/18). In addition, a mass detected by echography was the indication in two cases, and a mass on palpation was the indication in another two. Five of the seven cases with exploration were diagnosed before operation as neoplasms around the

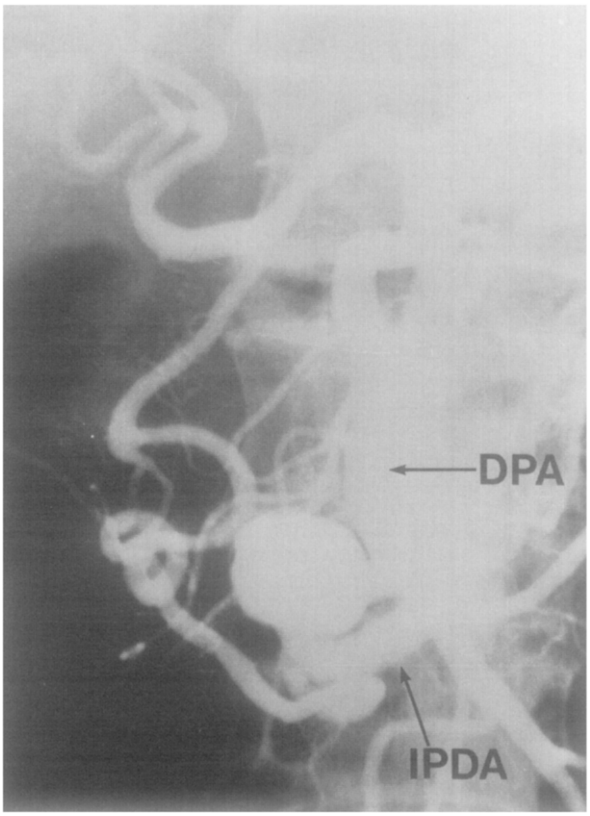

Fig. 4. Angiography by Seldinger's method reveals aneurysm at junction between dorsal pancreatic artery *(DPA)* and posterior inferior pancreaticoduodenal artery *(IPDA)*.

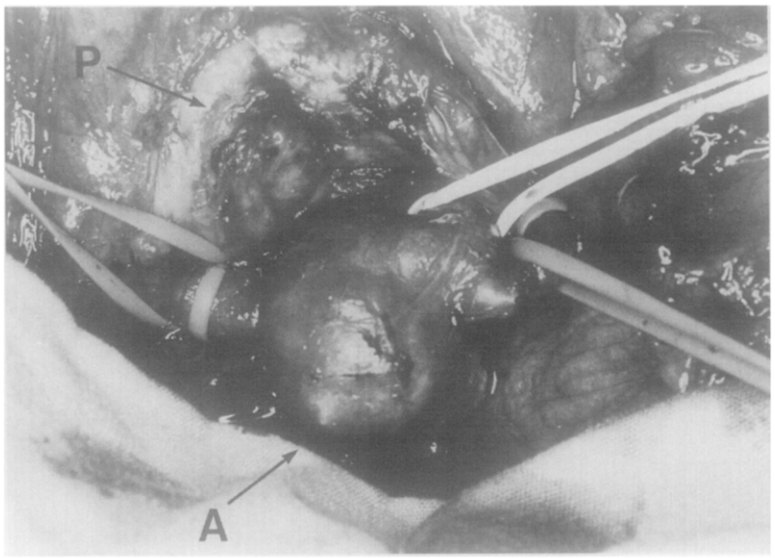

Fig. 5. Intraoperative picture demonstrates PDA aneurysm *(A)* isolated from pancreatic tissue *(P)*.

Table I. Summary of reported cases with PDA aneurysm

	Rupture group	*Nonrupture group*
Total cases	53	29
Diagnosis		
Exploration	23	9 (incidental, 2)
Angiography	18	19 (incidental, 8)
Autopsy	9	1 (incidental, 1)
N.S.	3	0
Size (mm)		
≤20	7	9
20-40	5	10
40<	7	5
N.S.	34	5
Cause		
Atherosclerosis	15	13
Pancreatitis	16	3
Others	7	2
N.S.	15	11
Treatment		
Curative operation	28	17
Other operation	11	4
Embolization	3	1
No treatment	11	5
N.S.	0	2
Mortality rate		
Total mortality rate (%)	26/53 (49.1%)	2/29 (6.9%)*
Operative mortality rate (%)	17/39 (43.6%)	0/17 (0%)

N.S., Not stated.
*Both patients died of an unrelated disease.

pancreatic head, and intraoperative angiography was performed for the essential diagnosis in two cases.[4,5]

According to Gangahar et al.,[6] aneurysms of the branches of the superior mesenteric artery seldom reveal any rim of calcification on plain radiography, unlike hepatic, splenic, or renal artery aneurysms. Foster[7] also reported that a rim of calcification was a rare finding, although it was demonstrable. In our analysis of reported cases, however, calcification seen on plain x-ray films seems to be quite an important indication for further examinations such as angiography. In the case presented here, a splanchnic artery aneurysm was initially suspected by the calcification that appeared on a plain X-ray film, and IVDSA was performed consequently. Although angiography is an indispensable examination for both the essential diagnosis and adequate surgical treatment of PDA aneurysm,[8] it is difficult to use routinely because of

Table II. Summary of nonrupture group excluding cases with incidental diagnosis

Author	*Age/sex*	*Chief complaint*	*Initial diagnosis*	*Definitive diagnosis*	*Size (mm)*	*Cause*
Van Ouwerkerk[13]	42/M	Abdominal pain	Mass on palpation	Operation	50	N.S.
Hendrick[14]	40/M	Abdominal pain	Abnormality of the duodenum on UGI	Operation	60	N.S.
Catanzaro[15]	52/F	Abdominal pain	Pyloric stenosis on UGI	Operation	40	N.S.
Kelley[16]	49/F	Abdominal pain	Calcification on plain X-p	Angiography	N.S.	N.S.
Lannik[17]	61/M	Abdominal pain	Calcification on plain X-p	Angiography	30	Atherosclerosis
Sutton[18]	21/F	Abdominal discomfort	Bruit on auscultation	Angiography	13	N.S.
Harris[19]	54/F	Abdominal pain	Calcification on plain X-p	Angiography	10	Atherosclerosis
Hasselgren[20]	62/F	Jaundice	Calcification on plain X-p	Operation	15	N.S.
Kadir[4]	63/F	Unrelated symptoms	Calcification on plain X-p	Operation	N.S.	N.S.
Kadir[4]	56/M	Jaundice	Calcification on plain X-p; tumor on US and UGI	Operation	20	N.S.
Jhaveri[5]	59/M	Abdominal pain	Cystic lesion on US	Operation	70	Pancreatitis
Samson[21]	56/F	Unrelated symptoms	Calcification on plain X-p	Angiography	30	Atherosclerosis
Harbin[9]	63/F	Unrelated symptoms	Mass shadow on plain X-p	Angiography	20	N.S.
Foster[7]	25/F	Abdominal pain	Calcification on plain X-p; thrill on palpation	Angiography	25	Atherosclerosis
Grech[22]	50/F	Unrelated symptoms	Tumor on US	Angiography	N.S.	Fibromuscular hyperplasia
Davies[23]	58/F	Abdominal pain	Calcification on CT	Angiography	25	Atherosclerosis
Chiou[24]	59/F	Abdominal pain	Calcification on CT; pulsatile mass on palpation	Angiography	30	Atherosclerosis
Iyomasa (present case)	78/M	Unrelated symptoms	Calcification on plain X-p	Angiography	30	Atherosclerosis

N.S., Not stated; *UGI*, upper gastrointestinal series; *X-p*, radiography; *US*, ultrasonography; *CT*, computed tomography.

patient discomfort. However, IVDSA is quite useful as a screening test because it is an easier and less invasive examination compared with conventional angiography such as Seldinger's method.[9] After a definitive diagnosis of PDA aneurysm is made by IVDSA, conventional angiography should be indicated for the preoperative minute investigation or for temporary management involving transcatheter embolization. Embolization may be strongly indicated in the patient at high risk. This therapy should also be considered when the location of the aneurysm or the presence of pancreatitis would make operation hazardous.[10-12] In our case, we chose surgical management as the definitive and radical therapy because the patient was vigorous in spite of his advanced age.

The mortality rate of PDA aneurysm with rupture is high. Therefore it is important to make an essential diagnosis and to treat the lesion before its rupture. For this purpose, it is important to note calcification on plain radiography and, when indicated, to perform aggressive angiography with IVDSA. Once the diagnosis of PDA aneurysm is established, surgical treatment should be performed immediately to prevent the potentially fatal complication of aneurysm rupture.

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